JUL 01 1993 (41)

Station #12

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ENGINEERING DATA TRANSMITTAL

Page 1 of 1

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16. KEY

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1	1	Cog.Eng. P. J. Valcich	P. Valcich	6-18-93	H6-04	C. E. Heiden	CE Heiden	6/18/93	H6-04	1	1
1	1	Cog. Mgr. G. C. Henckel	G C Henckel	6-18	H6-04	R. C. Roos	R C Roos	6/18/93	H6-04	1	1
1	1	QA S. O. Deleon	S. O. DeLeon	6/21/93	H4-16	D. R. Baker			X7-02	3	
3		Safety D. B. Tullis			L6-57	W. L. Johnson			H6-04	3	
3		Env. K. A. Gano			X0-21	D. G. Kachele			S4-67	3	
3		EDMC (2)			H6-08	Bruce Tuttle			N3-06	3	
3		ERC			H6-07	Central Files (2)			L8-04	3	

18.	19.	20.	21. DOE APPROVAL (if required)
C. E. Heiden / CE Heiden 06/29/93 / Signature of EDT Originator, Date	Authorized Representative for Receiving Organization, Date	G. C. Henckel / G C Henckel 6/18/93 / Cognizant/Project Engineer's Manager, Date	Ltr. No. [] Approved [] Approved w/comments [] Disapproved w/comments

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Author/Requestor (Printed/Signature) Date
C. E. Heiden CE Heiden 06/16/93

Intended Audience
[] Internal [] Sponsor [X] External

Responsible Manager (Printed/Signature) Date
R.C. ROOS ~~G. C. Henckel~~ R. C. Roos for 6-22-93

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SUPPORTING DOCUMENT

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6. Author

Name: C. E. Heiden

C E Heiden

Signature

Organization/Charge Code 81353/PB621

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7. Abstract

Heiden, C. E., *Riverland ERA Cleanup Sampling and Analysis Plan*, WHC-SD-EN-AP-138, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

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INTRODUCTION

The Riverland Expedited Response Action (ERA) site is the 100-IU-1 Operable Unit (Figure 1). The 100-IU-1 Operable Unit boundaries are Washington State Route 240 on the east, Washington State Highway 24 on the south, the Hanford Site boundary on the west, and the Columbia River on the north.

Characterization of potential waste sites within the Riverland ERA boundaries was conducted in October and November 1992. Sample data identified two hazardous waste sites requiring cleanup. These sites are the Riverland Rail Yard (6718 Building) and a pesticide/herbicide container site. The Riverland Rail Yard has diesel-contaminated concrete and soil. Pesticide-contaminated soils were found at the empty pesticide/herbicide container site.

Additional suspect waste sites found after characterization activities may require some degree of cleanup. Remnants of military communication battery packs were found at numerous locations. Another site consisting of suspect empty pesticide/herbicide or military oil containers has been found.

This sampling and analysis plan supports the Riverland ERA U.S. Environmental Protection Agency cleanup action memorandum recommendations and provides guidance for field personnel. Cleanup activities vary for each individual waste site. Field screening and sample collection (offsite laboratory analysis) will provide data to support clean closure.

This sampling and analysis plan contains two parts: the field sampling plan (Part 1) and the quality assurance project plan (Part 2). The field sampling plan describes the activities to be performed, defines sample designation, and identifies sample analysis to be performed. The quality assurance project plan establishes data quality objectives, defines analytical methods and procedures and documentation requirements, and provides established technical procedures to be used for field sampling and measurement. The quality assurance project plan details all quality assurance/quality control procedures to be followed to ensure that usable and defensible data are collected.

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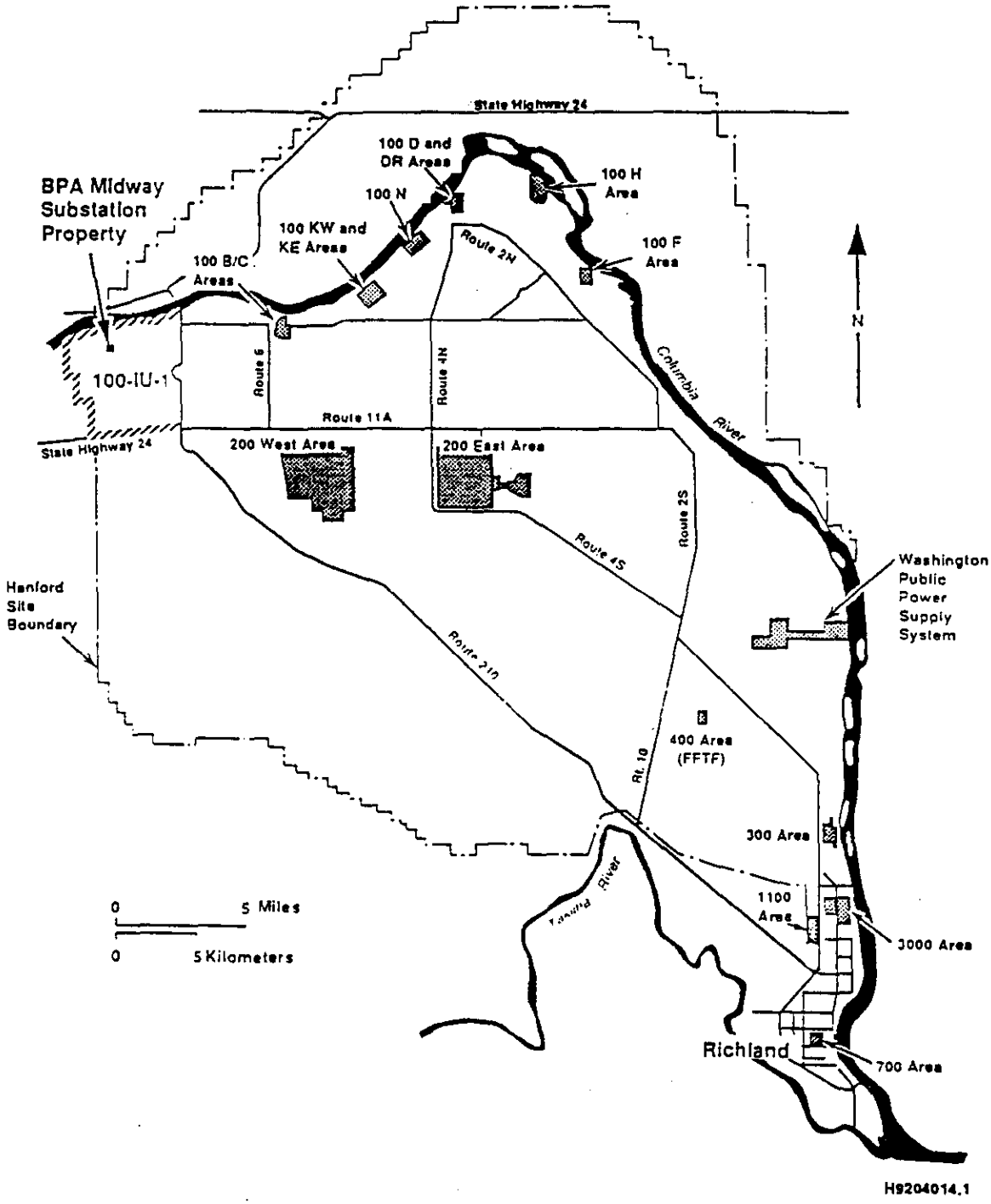
Figure 1. Riverland ERA Site Map.



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PART 1

FIELD SAMPLING PLAN

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CONTENTS

FIGURES:

TABLE:

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1.0 SAMPLING AND FIELD ACTIVITIES

1.1 SITE DESCRIPTIONS

At the Riverland Rail Yard (6718 Building) (Figure FSP-1, Location A) Maintenance Facility, radioactive decontamination of locomotives and railcars was performed. Decontamination occurred over two concrete maintenance pits. Occasional cleaning consisted of brushing with a broom and diesel fuel and rinsing with water. The rinse drained through the pit floor drains. The drain pipe system left the south side of building and routed out to an open ditch.

Characterization activities consisted of collecting concrete samples from around floor drains. South of the building a soil sample was collected from inside the pipe system. Soil samples were collected from the open ditch and field screened for diesel contamination.

At a homestead site (Figure FSP-1, Location D) empty herbicide/pesticide containers were found. During characterization a composite soil sample was collected from underneath the containers.

A second similar site (Figure FSP-1, Location D) found after characterization activities has suspect empty containers. The containers are similar to the pesticide cans although they are in a much more deteriorated state. The cans could also be military oil containers. The site is not directly associated with a homestead. The containers are located approximately 1/4 mi northeast of the homestead site. No field screening or sampling has been conducted at the site prior to cleanup activities.

Remnants of military battery packs have been found in various locations throughout the sagebrush. These sites are scattered in the southwest corner of the operable unit (Figure FSP-1, Location D). Each site has been staked and flagged for relocation.

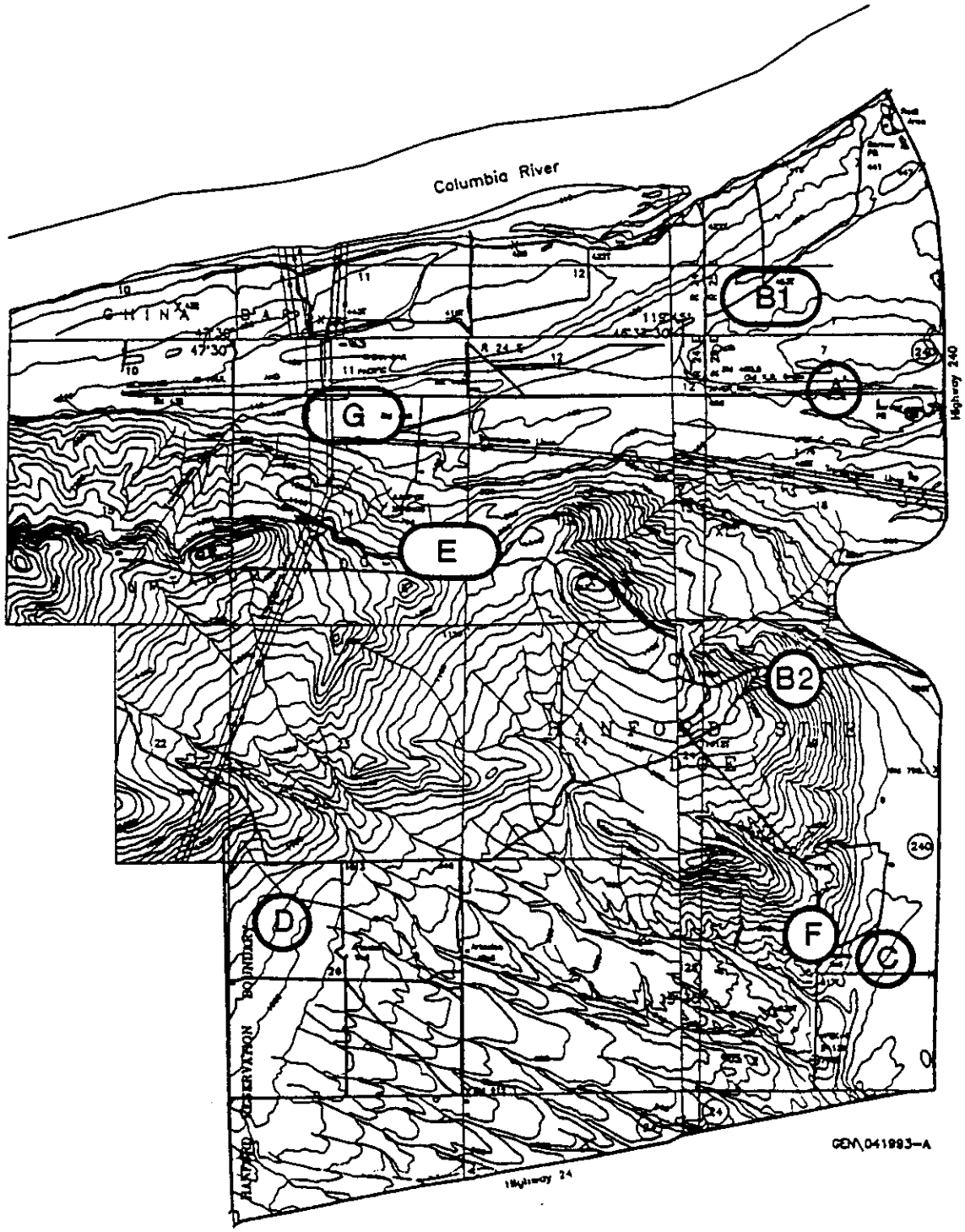
A general landlord cleanup of the operable unit will also be performed. These sites do not require any field screening or sampling because no environmental hazards exist. Landlord cleanup areas are the McGee fish farm, munitions cache, military debris site (transite), and abandoned vehicles. Figure FSP-1 illustrates the general locations.

1.2 CONTAMINANTS OF CONCERN

The following is a list of sites that contain environmental hazards as identified during characterization activities. For those sites not previously sampled during characterization, field screening will be utilized to identify potential contaminants.

- Riverland Rail Yard Maintenance Facility (6718 Building)--Diesel-contaminated concrete, vitrified clay pipe, and soil.
- Herbicide/Pesticide Site--Aldrin- and Dieldrin-contaminated soil.

Figure FSP-1. Waste Site Locations (USGS 1986).



A— Riverland Rail Yard Site
B1— Anti-Aircraft Artillary Site, H71
B2— Anti-Aircraft Artillary Site, H70
C— Munitions Cache Site
D— Pesticide/Herbicide Sites/Military Batteries
E— Transite Dump Site
F— McGee Fish Farm
G— BPA Property

- Suspect Container Site--Potential herbicide/pesticide or oil-contaminated soil.

- Military Batteries--Potential metal-contaminated soil.

Based on radiological surveys conducted at the 100-IU-1 Operable Unit (WHC 1993), all waste sites within its boundaries have been exempt from future unconditional release surveys.

All hazardous wastes drummed for offsite disposal will be controlled in accordance with EII 4.3, "Control of CERCLA and Other Past Practice Investigation Derived Waste" (WHC 1988a).

1.3 FIELD SCREENING

Field screening will support cleanup activities by confirming cleanup levels and correlation with laboratory data. Following the completion of the applied cleanup technique, confirmatory field-screening samples will be collected. Sites requiring field screening include the Riverland Rail Yard, pesticide/herbicide container site, suspect container site, and numerous military battery locations. Samples will be field screened for evidence of contaminants as indicated in Section 1.2. Immunoassay field testing kits and x-ray fluorescence are the screening methods to be used on collected samples.

Field screening for radiation will be conducted only at the Rail Yard site. This screening is for characterization only, not for health and safety determination. If the field team leader finds radioactive contamination levels two times above background (ambient), work will immediately stop. Health Physics will be contacted for assistance. Ambient radiation will be determined 3 ft over the work site before work starts. Instrumentation will be used in accordance with EII 3.2, "Calibration and Control of Monitoring Instruments," and EII 3.4, "Field Screening" (WHC 1988a).

An organic vapor meter (OVM) may be used for screening volatile compounds. It will be checked daily in accordance with EII 3.2, "Calibration and Control of Monitoring Instruments" (WHC 1988a).

As previously stated in Section 1.2, all waste sites within the Riverland ERA are exempt and no radiological monitoring will be required.

All field-screening activities will be recorded in the field logbook.

1.4 CLEANUP ACTIVITIES

Cleanup activities vary for each site and are covered individually in the following sections.

1.4.1 Riverland Rail Yard (6718 Building)

The cleanup goal of the Riverland Yard Maintenance Facility is to reduce diesel fuel contamination to below 200 ppm. Diesel contamination exists on concrete surfaces of maintenance pits and floor, in vitrified clay drain

pipes, and in the drainage ditch soils. All collected contaminated materials will be bioremediated by landfarming on the concrete floor of the 6718 Building. During the time the materials are under bioremediation, the site will be closed off with safety fencing.

A backhoe will excavate the approximately 2 ft of fill over the concrete floor and pits. All surfaces of the maintenance pits will be sandblasted. It is unknown if the concrete floor was cleaned with diesel fuel and water as were the maintenance pits. The floor will be sandblasted only if field-screening results indicate values greater than 200 ppm of diesel. Sandblasting residue will be bioremediated.

After sandblasting, a jackhammer will be used to break concrete around the floor drains. This will allow sampling of soils below the floor drains to screen for contaminants. If any loose material is available inside the pipes, it will also be sampled. Breaking of pipes may be necessary to allow sampling. If either the soils under the concrete or the contents of the pipe have diesel contamination levels greater than 200 ppm, the drain lines will be removed.

Following sandblasting, confirmatory field samples will be collected. A portable pneumatic scabbler with chipping bits will chip concrete surfaces. Between sampling locations, the scabbler bits will be field decontaminated in accordance with EII 5.4, "Field Decontamination of Drilling, Well Development, and Sampling Equipment," and EII 4.3, "Control of CERCLA and Other Past-Practice Investigation Derived Waste" (WHC 1988a). The sampling site and scabbler bits may be kept damp with distilled water for dust and contamination control.

Vitrified clay drain pipes leaving the south side of the building will be excavated. The pipe will be removed 43 ft to the south to the point of a tee. At the tee, pipe routing east to the open ditch will be excavated. All excavation work will strictly adhere to guidelines stated in the health and safety plan and the job control work package. Broken clay pipe and its contents will be bioremediated.

Contaminated soils in the open ditch will be excavated and bioremediated. The ditch is 388 ft long. Anticipated depths of contamination are expected to be no greater than 1 ft.

1.4.2 Pesticide Container Site

Empty pesticide cans will be crushed and placed in a waste drum for offsite disposal. Soils beneath the cans will be excavated with shovels and drummed for appropriate disposal. The containers cover a 6- by 18-ft area. It is not anticipated to excavate beyond 1 ft.

A second group of suspect containers found after characterization activities will be removed. Field-screening samples will be collected to identify any potential contaminants. If screening results are negative, the containers will be treated as normal trash. In the event of positive results, the site will be dealt with in the same manner as the other container site.

1.4.3 Military Batteries

Military batteries will be collected in plastic bags and placed in a waste drum. Soils immediately beneath the batteries will be field screened for metals. Any contaminated soils will be removed and placed with batteries.

1.4.4 Landlord Cleanup

Landlord cleanup will include trash and debris removal. All waste will be disposed of at the Hanford Site Central Landfill.

A commercial fish farm at the McGee Ranch has plastic-lined ditches, plastic pipe, wood, and metal to be removed. A small wooden building at the site will be torn down. A few of the depressions may be filled with dirt and leveled. Disturbances to re-established vegetation will be kept to a minimum.

An empty munitions cache will be filled with dirt. The site had a wooden box placed in the ground about 2 by 3 by 2 ft deep.

Approximately 1 mi west of a former anti-aircraft artillery (AAA) site is an area of surface debris. Debris consists of transite, metal strapping, and wood. The type of debris suggests it came from the demolition of structures from the AAA site.

Three abandoned vehicles at various sites will also be removed.

1.5 SAMPLE COLLECTION

Sample activities will vary for each individual site. Sampling methods, locations, and quantity are described in the following sections. The field team leader will record sampling activities and locations in accordance with EII 1.5, "Field Logbook" (WHC 1988b).

Sample collection will be at those locations at which the highest degree of contaminants existed (floor drains and soil beneath pesticide cans) prior to cleanup activities. This will provide accurate representativeness of environmental conditions following cleanup.

1.5.1 Riverland Rail Yard (6718 Building)

Prior to any sampling or sandblasting, a visual inspection will be made of all concrete surfaces to locate areas of special concern. Physical appearances (i.e., oil-stained surface) may be one criterion for sample location selection.

Field screening for radiation may be conducted during the various phases of cleanup at the Rail Yard site. Radiation screening will be conducted in accordance with Section 1.3.

Figure FSP-2 shows the locations of nine floor drains. Three drains are in the maintenance pits. The remaining drains are at ground level. To determine if sandblasting of the floor is necessary, field-screening samples will be collected. Sample locations will be around the six floor drains. Additional areas may be screened based on the visual inspections of the concrete.

A portable pneumatic scabbler will be used to acquire the concrete samples as described in Section 1.4.1. Samples will be homogenized in a clean stainless steel bowl. Each sample collection will use a separate decontaminated hand tool (i.e., spoon, trowel) in accordance with EII 5.2, "Soil and Sediment Sampling" (WHC 1988a).

Following completion of concrete sandblasting, confirmatory field-screening samples will be collected. Sandblasting will be considered complete when screening data indicate diesel values below 200 ppm. Immunoassay kits will be used for the field screening.

Total activity samples will be collected at each offsite laboratory sample location. These samples will be analyzed at the 222-S Laboratory. These samples are being collected only at the Riverland Rail Yard site.

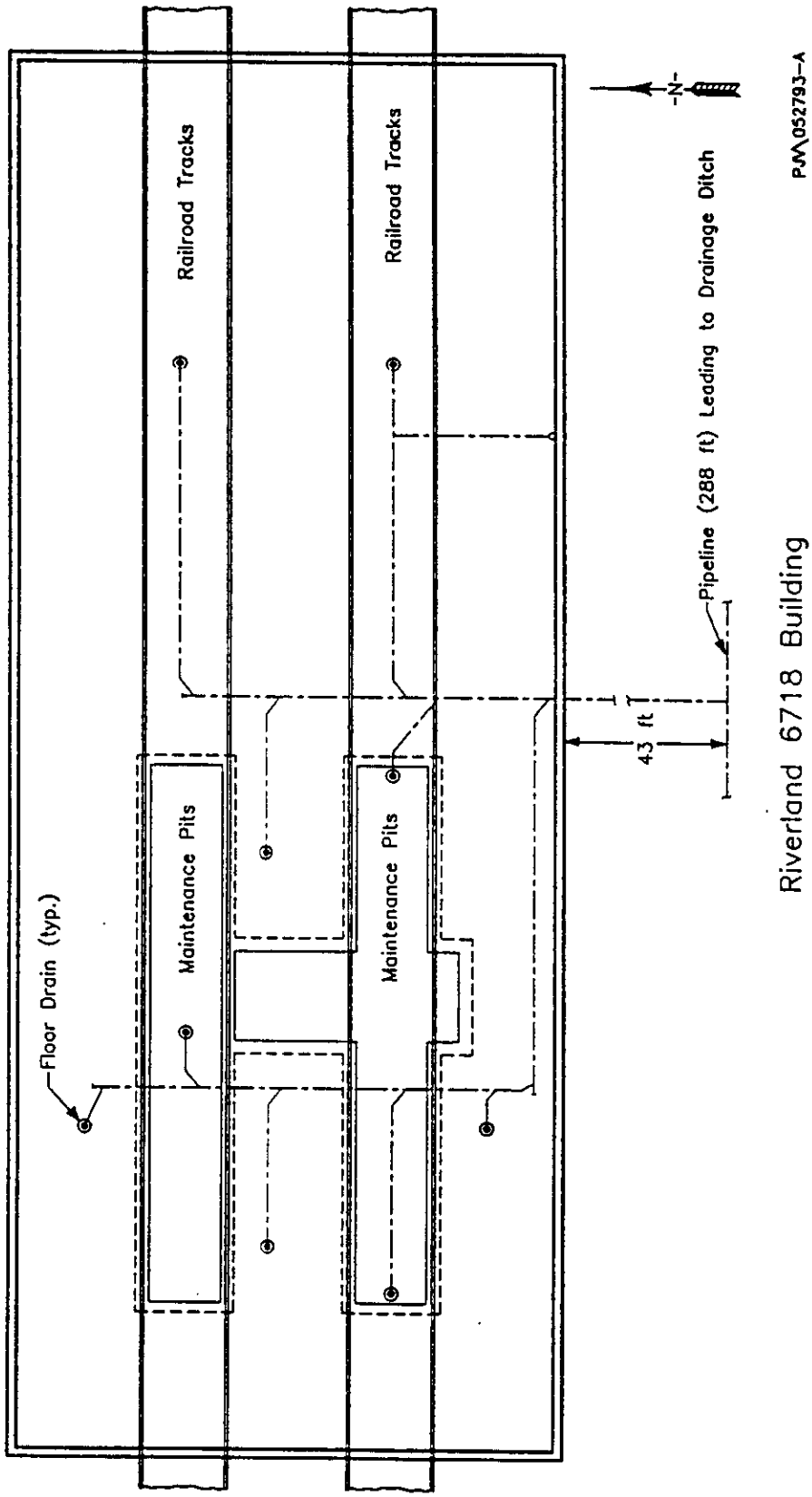
Ten concrete samples will be collected for offsite laboratory analysis. The following is a sample location list:

- Maintenance pits--Three samples from area around drains.
- Concrete floor--Two samples from area around floor drains. Actual drains sampled to be determined in the field. Criteria for selection include screening results and visual inspections (i.e., oil-stained sites).
- Two samples from either maintenance pits or floor area. Sites to be selected in the field by field team leader. Criteria used for sample location will be the same used for the concrete floor.
- Quality assurance/quality control--Three samples consisting of duplicate, split, and equipment blank.

Soil underneath concrete at maintenance pit drains will be accessed by jackhammering. Three screening and laboratory samples will be collected at each site. It is unknown if the pipes contain loose material for sampling. If pipe material is available, field-screening samples will be collected. Hand tools will be utilized to collect the samples.

Screening and laboratory samples will be collected from the drainage ditch to confirm adequate removal of contaminated soil. Two soil samples will be sent for offsite analysis. Sample locations will be near the head of the drainage ditch. Actual sites will be determined in the field by the field team leader. Ditch excavation depth is expected to be 1 ft or less. Soil excavations may not be necessary the entire ditch length. Field-screening results and visual inspection (discolored soil) will be the criteria for this determination. Excavation will continue 10 ft beyond the point at which clean soil exists. An occasional hole may be dug to depths of 2 to 3 ft to field

Figure FSP-2. 6718 Building Floor Drain Plan.



screen for radiation. Excavated soils will be field screened for radiation in accordance with Section 1.3. Direct surface sampling will be used. Each sample location will use a separate decontaminated hand tool (i.e., spoon, trowel) in accordance with EII 5.2, "Soil and Sediment Sampling" (WHC 1988a).

Following collection, samples are labeled, packaged, and sent to a qualified laboratory for analysis. All samples sent for qualified laboratory analysis are labeled and tracked using Hanford Environmental Information System (HEIS) identification numbers in accordance with EII 5.10, "Obtaining Sample Identification Numbers and Accessing HEIS Data" (WHC 1988a). Sample packaging is done in accordance with EII 5.11, "Sample Packaging and Shipping" (WHC 1988a).

A chain of custody starts and is maintained when the sample is collected. The chain of custody is in accordance with EII 5.1, "Chain of Custody" (WHC 1988a).

Field screening and offsite laboratory samples of the bioremediated materials will be collected at the start of bioremediation and about late September. Three sites will be selected for sampling and will include a duplicate and split. If contamination levels are below 200 ppm, fencing surrounding the area can be removed.

1.5.2 Pesticide Container Sites

Field screening utilizing immunoassay kits will aid in confirming the removal of contaminated soil. A kit specific for the pesticides Aldrin and Dieldrin will be used on the known contaminated site.

A surface composite sample (field screening and offsite laboratory) will be collected with hand tools. Samples will be homogenized in clean stainless steel bowls. For comparison, a background sample will be collected. This location will be determined by the field team leader. The cleanup level for Aldrin and Dieldrin is 2 ppm.

At the suspect site, immunoassay kits for cyclodiene pesticides and oil will be used. If any contamination is identified, one sample and a split will be collected.

1.5.3 Military Batteries

After battery removal, surface soil will be collected. Samples will be field screened using x-ray fluorescence (XRF) for metals. XRF data will aid in determining if soil removal is necessary. Additional sampling after soil removal will aid in confirming sufficient cleanup.

2.0 ANALYSES

Qualified laboratory sample analysis shall be according to U.S. Environmental Protection Agency (EPA) protocols (EPA 1986). Laboratory sample analysis (Table FSP-1) shall satisfy Level IV (Contract Laboratory Program [CLP]) requirements for verification and validation.

Table FSP-1. Laboratory Sample and Analysis.

Parameters of interest	Analytical method	Target detection limit	Precision	Accuracy	Complete-ness
Diesel Total Petroleum Hydrocarbons	CLP	1 mg/L	±20%	±30%	90%
Pesticides/ Herbicides	CLP	80.0 µg/kg	±50%	±42-139%	90%

CLP = Contract Laboratory Program procedure.

Sample data sets for each parameter of interest will be comparable in that all samples are being analyzed per CLP analytical methods.

3.0 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

It is anticipated that approximately 10 concrete and 10 soil samples will be collected at the Riverland Rail Yard site for laboratory verification and validation. For this group of samples, the following quality assurance/quality control (QA/QC) samples shall be collected: (1) two duplicates - one for concrete and soil, (2) two splits - one for concrete and soil, and (3) one equipment blank. The blank sample matrix will be silica sand.

At the homestead pesticide container site, a composite soil sample will be collected for laboratory verification and validation. A split sample will also be collected.

Additional sampling may require additional QA/QC sample collections. The QA/QC sample quantity will be at the discretion of the field team leader.

4.0 MODIFICATIONS TO SAMPLING PLAN

Due to field conditions, the sampling plan may require changes. Minor changes will require, at least, the verbal approval of the field team leader and/or cognizant project engineer. In this situation, the field team leader will submit changes on the Sampling Project Change Form (Figure FSP-3). An

Figure FSP-3. Riverland ERA Sampling Plan Change Form.

Date: _____

Person Initiating Change: _____

Change: _____

_____

_____

_____

_____

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_____

Reason For Change: _____

_____

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_____

_____

_____

APPROVAL:

Field Team Leader: _____

Cognizant Engineer: _____

Environmental QA Representative: _____

Engineering Change Notice will be released by the project engineer in accordance with EP-2.2, "Engineering Document Change Control" (WHC 1988b), and the project file will contain a copy. Major changes to the plan (i.e., changes to sampling parameters, Table FSP-1) will require lead regulatory agency concurrence on an approved Document Change Request Form.

5.0 REFERENCES

EPA, 1986, *Test Methods for Evaluating Solid Waste Physical/Chemical Methods*. SW-846, U.S. Environmental Protection Agency, Washington, D.C.

USGS, 1986, *Coyote Rapids, Wash.*, map no. 46119-F5-TF-024, U.S. Geological Survey, Denver, Colorado.

WHC, 1988a, *Environmental Investigations and Site Characterization Manual*, WHC-CM-7-7, et seq., Westinghouse Hanford Company, Richland, Washington.

WHC, 1988b, *Standard Engineering Practices*, WHC-CM-6-1, et seq., Westinghouse Hanford Company, Richland, Washington.

WHC, 1993, *Riverland ERA USRADS Radiological Survey*, WHC-SD-EN-TI-170, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

PART 2

QUALITY ASSURANCE PROJECT PLAN

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CONTENTS

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1.0 INTRODUCTION

The quality assurance project plan (QAPP) describes the quality assurance (QA) requirements that support the Riverland Expedited Response Action (ERA) cleanup activities. This QAPP presents the objectives, organizations, functional activities, procedures, and specific QA and quality control (QC) protocols associated with these activities.

2.0 PROJECT DESCRIPTION

The ERA cleanup objective is to clean up environmental hazards identified during characterization activities. Samples will be collected to verify clean closure.

The sampling analysis plan (Part 1, Section 1.0) contains the site's description.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

QAPP responsibilities of key personnel and organizations are as follows:

- **Field Team Leader (Environmental Restoration Engineering).** Responsible for onsite direction of the sampling team in compliance with the requirements of this QAPP, the sampling plan, and all implementing Environmental Investigation Instructions (EII).

- **Cognizant Quality Assurance Engineer (Environmental Quality Assurance).** The QA person is responsible for performing formal audits/surveillances to ensure compliance with QAPP requirements (WHC 1990a).

- **Hanford Area Sample Management (HASM).** HASM is responsible for coordinating qualified and approved laboratory support for all project analyses concerns, assisting in sample shipment tracking, resolving chain-of-custody issues, and, when requested, validating all related data.

- **Qualified Analytical Laboratories.** Soil samples shall be sent to a Westinghouse Hanford Company- (WHC) approved contractor, participant subcontractor, or subcontractor laboratory. The laboratory shall be responsible for performing the analyses identified in this plan in compliance with work order, contractual requirements, and WHC-approved procedures (see Section 5.0). Each laboratory shall have and comply with a written approved laboratory QA plan. All analytical laboratory work shall be subject to the surveillance controls invoked by QI 7.3, "Source Surveillance and Inspection" (WHC 1989). This plan will meet the appropriate requirements of the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al.

1989). HASM will retain prime responsibility for ensuring acceptability of offsite laboratory activities.

- **Other Support Contractors.** The project engineer may assign project responsibilities to other support contractors. Such services shall be in compliance with standard WHC procurement procedures as discussed in Section 5.0. All work shall comply with WHC-approved QA plans and/or procedures.

4.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT

The QAPP's principal objective is to maintain the quality of field activities, sample handling, laboratory analysis, and to document each processing level.

The EPA devised an analytical level classification system (EPA 1987) that provides increased data quality as the scale increases. Level I consists of field-screening methods. Level II entails more advanced onsite analytical techniques. Level III concerns standard laboratory program procedures (SW-846). Level IV consists of EPA Contract Laboratory Program (CLP) procedures. Level V addresses specially developed procedures where standard methods are not available or require a high degree of analytical sensitivity.

WHC developed a site-specific analytical classification that fulfills the EPA data quality goals. It consists of two data quality levels: field or laboratory screening and validated laboratory analyses (McCain and Johnson 1990). Field or laboratory screening is equal to EPA Levels I, II, and III. Validated laboratory analyses are equal to EPA Levels IV and V.

The following is a list of the parameters of interest:

- Total Petroleum Hydrocarbons (TPH) Diesel Range - Level IV analysis (CLP)
- Pesticides/Herbicides - Level IV analysis (CLP).

5.0 SAMPLING PROCEDURES

All sampling activities shall be consistent with the current applicable WHC (1988a) procedures and the Sodium Dichromate ERA Cleanup Sampling Plan (WHC 1993). These procedures are identified in the project field sampling plan. They include the following:

- EII 1.4, "Instruction Change Authorizations"
- EII 1.5, "Field Logbooks"

- EII 1.6, "QA Records Processing"
- EII 1.7, "Indoctrination, Training, and Qualification"
- EII 3.4, "Field Screening"
- EII 5.1, "Chain of Custody"
- EII 5.2, "Soil and Sediment Sampling"
- EII 5.5, "1706 KE Laboratory Decontamination of RCRA/CERCLA Sampling Equipment"
- EII 5.11, "Sample Packaging and Shipping."

As noted in Section 3.0, procured participant contractor and/or subcontractor services shall be subject to the following (WHC 1989):

- QI 4.0, "Procurement Document Control"
- QI 4.1, "Procurement Document Control"
- QI 4.2, "External Services Control"
- QI 7.0, "Control of Purchased Items and Services"
- QI 7.1, "Procurement Planning and Control"
- QI 7.2, "Supplier Evaluation "
- QI 7.3, "Source Surveillance and Inspection"
- QI 17.0, "Quality Assurance Records"
- QI 17.1, "Quality Assurance Records Control"
- EII 1.6, "QA Records Processing" (WHC 1988a).

The procurement document shall specify that the contractor submit for WHC review and approval prior to use all analytical procedures and its QA/QC program. All participant contractor or subcontractor procedures, plans, and/or manuals shall be retained as project quality records.

6.0 SAMPLE CUSTODY

Project samples shall be controlled in accordance with EII 5.1, "Chain of Custody," from the point of origin to the analytical laboratory and 222-S Laboratory (total activity). Laboratory chain-of-custody procedures shall be reviewed and approved as required by WHC procurement control procedures as noted in Section 5.0. The contractor shall ensure the maintenance of sample integrity and identification throughout the analytical process. Offsite sample tracking will be performed by the HASM procedure, "Sample Tracking."

Results of analyses shall be traceable to original samples through a unique code or identifier. WHC will assign the samples Hanford Environmental Information System (HEIS) sample numbers. All results of analyses shall be controlled as permanent project quality records.

7.0 CALIBRATION PROCEDURES

Calibration of all critical WHC measuring and test equipment, whether in existing inventory or newly purchased, shall be controlled as required by the following:

- QR 12.0, "Control of Measuring and Test Equipment"
- QI 12.1, "Acquisition and Calibration of Portable Measuring and Test Equipment"
- QI 12.2, "Measuring and Test Equipment Calibration by User"
- EII 3.1, "User Calibration of Health and Safety Measuring and Test Equipment."

Routine field equipment operational checks shall be per applicable EIIs or procedures. Similar information shall be provided in WHC-approved participant contractor or subcontractor procedures.

Participant contractor or subcontractor laboratory analytical equipment calibrations shall be in accordance with applicable standard analytical methods. These shall be subject to WHC review and approval.

8.0 ANALYTICAL PROCEDURES

Procedures based on the referenced methods shall be selected or developed, and approved before use in compliance with appropriate WHC procedure and/or procurement control requirements as noted in Section 5.0.

9.0 DATA REDUCTION, VALIDATION, AND REPORTING

9.1 DATA REDUCTION AND DATA PACKAGE PREPARATION

All analytical laboratories shall be responsible for preparing a report summarizing the analysis results and a detailed data package (WHC 1990b). This includes all information necessary to perform data validation to the extent indicated by the minimum requirements of Section 9.2. Data shall be reported on a dry-weight basis. The data summary report format and data package content shall be defined in procurement documentation subject to WHC review and approval as noted in Section 5.0. As a minimum, laboratory data packages may include the following:

- Sample receipt and tracking documentation, including identification of the organization and individuals performing the analysis, the names and signatures of the responsible analysts, sample holding time requirements, references to applicable chain-of-custody

procedures, and the dates of sample receipt, extraction, and analysis

- Instrument calibration documentation, including equipment type, model, initial and continuing calibration data, method of detection limits, and calibration procedure used

- Additional QC data, as appropriate for the methods used, including matrix spikes, duplicates, recovery percentages, precision data, laboratory blank data, and identification of any nonconformance that may have affected the laboratory's measurement system during the analysis time period

- The analytical results or data deliverables, including reduce data, reduction formulas or algorithms, unique laboratory identifiers, and description of deficiencies

- Other supporting information, such as reconstructed ion chromatographs, spectrograms, traffic reports, and raw data.

All sample data shall be retained by the analytical laboratory and made available for systems or program audit purposes upon request by WHC, U.S. Department of Energy, Richland Operations Office, or regulatory agency representatives (see Section 11.0). Such data shall be retained by the analytical laboratory through the duration of its contractual statement of work, at which point it shall be turned over to WHC for archiving.

9.2 VALIDATION

The completed data package shall be reviewed and approved by the analytical laboratory's QA Manager before submittal to WHC for validation (WHC 1990b). Validation of the completed data package shall be performed by qualified WHC HASM or other contract personnel. Validation requirements will be defined within the approved procurement document or WHC HASM data validation procedures (WHC 1992).

For analyses performed by qualified laboratories, validation reports shall be prepared. The results of these analyses will be substantiated with checks as applicable per the analytical procedure.

9.3 FINAL REVIEW AND RECORDS MANAGEMENT CONSIDERATIONS

All validation reports and supporting analytical data packages shall be subjected to a final technical review by qualified reviewers at the direction of the WHC Project Engineer. This will be done before data submittal to regulatory agencies or inclusion in reports or technical memoranda. All validation reports, data packages, and review comments shall be retained as permanent project quality records in compliance with EII 1.6, "Records Management" (WHC 1988a), and QA 17.0, "Quality Assurance Records" (WHC 1989). The Project Engineer will have the primary responsibility for dispositioning project-related records and data.

10.0 INTERNAL QUALITY CONTROL

Sampling plan activities may be evaluated as part of the project's QC effort. All analytical samples shall be subject to in-process QC measures from the field to the laboratory and during laboratory processing. Laboratory analyses performance audits are implemented through the use of QA/QC samples sent to multiple laboratories. The data quality generated in this project will be operationally defined by the following internal QC sampling.

- Split samples shall be collected and submitted to separate laboratories for a measurement precision assessment
- Duplicate samples shall be collected and submitted to measure intralaboratory precision
- Equipment blanks (matrix-silica sand) shall be prepared and submitted to assess sampling equipment cleanliness
- Laboratory internal quality control checks performed per applicable protocol for the analysis. For chemical analysis, this must include data demonstrating achieved accuracy, precision, system calibration, and performance. Reportables will include:
  - Preparation and calibration blanks
  - Calibration verification standards
  - Matrix spikes
  - Duplicates
  - Control samples
  - Other supporting documentation.

The minimum requirements of this section shall be invoked in procurement documents or work orders, compliant with standard WHC procedures as noted in Section 5.0.

11.0 PERFORMANCE AND SYSTEMS AUDITS

Program activities are subject to oversight by WHC QA personnel. Audits may address quality-affecting activities that include, but are not limited to, measurement system accuracy, intramural and extramural analytical laboratory services, field activities, and data collection, processing, validation, reporting, and management. WHC QA audits will be performed under the Standard Operating Procedure requirements of WHC (1989).

System audit requirements are implemented in accordance with Standard Operating Procedure QI 10.4, "Surveillance." All quality-affecting activities are subject to surveillance. The Project Engineer will interface with both the Environmental Field Services Quality Coordinator and the QA Officer. The QA Officer is responsible for providing independent formal audits/surveillances to ensure compliance with planned activities and to identify conditions adverse to or enhancing overall performance quality.

12.0 PREVENTIVE MAINTENANCE

All measurement and testing equipment used in the field and laboratory that directly affect analytical data quality shall be subject to preventive maintenance measures that ensure minimization of measurement system downtime. Field equipment maintenance instructions shall be as defined by the approved procedures governing their use. Laboratories shall be responsible for performing or managing the maintenance of their analytical equipment; maintenance requirements, spare parts lists, and instructions shall be included in individual methods or in laboratory QA plans, subject to WHC review and approval. When samples are analyzed using EPA reference methods, the preventive maintenance requirements for laboratory analytical equipment are as defined in the procured laboratory's QA plan(s).

13.0 DATA QUALITY INDICATORS

13.1 DATA ASSESSMENTS BY ANALYTICAL FACILITY

Adherence to approved procedures will be sufficient for the majority of data reports. To the extent possible, performance-based standards will be the preferred method of assessment for precision and accuracy measurements. A familiar example is the use of control charts. Values exceeding a 3-sigma limit on well-established and appropriate control chart should be flagged when reported. Samples in the analytical batch should be rerun if possible and those results also reported.

When appropriate performance-based standards are not available and referenced procedures do not specify, the following two rules may be used.

(1) Precision--The difference between laboratory duplicates will be subject to a control limit of 150% of the requested limit whenever both sample values exceed the estimated method detection limit (MDL). If the estimated MDL exceeds the requested limit, the higher value may be used to calculate the control limit. When either or both duplicates are below the estimated method detection limit, laboratory precision may be assessed by comparing identically spiked samples. Samples exceeding five times the control limit can be subject to a 20% relative percent difference limit, where:

$$\text{Relative Percent Difference} = \frac{(S - D) \times 100}{((S+D)/2)}$$

S = Sample concentration
D = Duplicate sample concentration

Failure to meet a precision limit will require evaluation and corrective action as appropriate.

(2) Accuracy will be defined by percent recovery data where

$$\% \text{ Recovery} = \frac{(\text{Spiked Sample Result} - \text{Sample Result})}{\text{Spike Added}} \times 100$$

When the sample result (SR) is less than the MDL, use SR=0 for the purpose of calculating the percent recovery. Spiked samples having concentrations two to five times greater of the requested detection limit or MDL will have recovery control limits of 50% to 150%. Spiked samples exceeding five times the estimated MDL will have recovery control limits of 75% to 125%. Failure to meet the control limit will require evaluation and corrective action as appropriate. Applicable samples not meeting the limit should be rerun using a postdigestion spike if possible. Postdigestion spikes should be made at two times the indigenous level or lower reporting limit, whichever is greater.

13.2 PROJECT LEVEL ASSESSMENTS

All data requested through HASM will be subject to validation procedures as previously described (Section 9.2). Completeness of requested analyses will be assessed and reported to the Project Engineer by WHC HASM or subcontractor. The EPA guidance suggests 80% to 85% validation is a reasonable expectation (EPA 1987).

Summary statistics for measurement precision and accuracy shall be prepared in conjunction with the data analysis.

Precision evaluation at the project level will address interlaboratory precision. Precision of environmental measurement systems is often a function of concentration. This relationship should be considered before selecting the most appropriate form of summary statistic. Simplistically, this relationship can usually be classified as falling into one of the following three categories:

(1) Standard deviation (or range) is constant

(2) Coefficient of variation (or relative range) is constant

(3) Both standard deviation (or range) and coefficient of variation (or relative range) vary with concentration.

The pooled standard deviation or pooled coefficient of variation can be used to summarize data in categories 1 and 2, respectively. Category 3 will require either graphical summary of the data or specialized regression techniques.

Data quality assessments are generally made at concentrations typical of the observed range in routine analyses. In some situations the typical value measurement will be below an estimated practical method, or instrument detection limit (i.e., an engineering zero). If a standard exists (or is to be set) at some positive finite value, quality assessment summaries may be desired at that level rather than the most representative concentration.

14.0 CORRECTIVE ACTIONS

Request for corrective action required as a result of surveillance reports, nonconformance reports, or audit activity shall be documented and dispositioned as required by QR 16.0, "Corrective Action;" QI 16.1, "Trending/ Trend Analysis;" and QI 16.2, "Corrective Action Reporting" (WHC 1989). Primary responsibilities for corrective action resolution are assigned to the Project Engineer and the QA Engineer. Other measurement systems, procedures, or plan corrections that may be required as a result of routine review processes shall be resolved as required by governing procedures or shall be referred to the Project Engineer for resolution. Copies of all surveillance, nonconformance, audit, and corrective action documentation shall be routed to the project QA records upon completion or closure.

15.0 QUALITY ASSURANCE PROJECT REPORTS

Special QA reports are not planned for this project. Project records will be maintained in conformance with standard operating procedure requirements of WHC (1989). Project records will be maintained according to EII 1.6, "QA Records Processing," and technical data will be dispositioned according to EII 1.11, "Technical Data Management." Surveillance, nonconformance, audit, and corrective action documentation shall be routed to the project quality records upon completion or closure of the activity. The final report shall include an assessment of the overall adequacy of the total measurement system with regard to the data quality objectives of the investigation.

16.0 REFERENCES

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EPA, 1987, *Data Quality Objectives for Remedial Response Activities: Development Process*, EPA/540/6-87/003, Office of Emergency and Remedial Response and Office of Waste Programs Enforcement, U.S. Environmental Protection Agency, Washington, D.C.

McCain, R. G. and W. L. Johnson, 1990, *A Proposed Data Quality Strategy for Hanford Site Characterization*, WHC-SD-EN-AP-023, Rev. , Westinghouse Hanford Company, Richland, Washington.

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WHC, 1990a, *Environmental Engineering, Technology, and Permitting Function Quality Assurance Program Plan*, WHC-EP-0383, Westinghouse Hanford Company, Richland, Washington.

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WHC, 1992, *Expedited Response Action Interface Meeting Minutes*, Westinghouse Hanford Company, Richland, Washington.

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